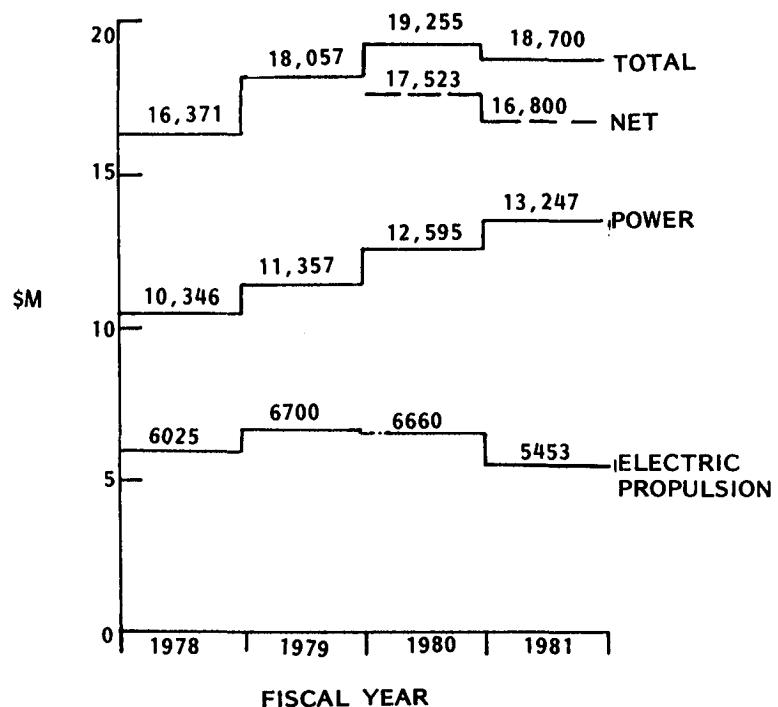


NASA TECHNOLOGY PROGRAM OVERVIEW

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SPACE POWER AND ELECTRIC PROPULSION TOTAL R & D (\$K)



PHOTOVOLTAIC ENERGY CONVERSION (3.2M/58 DPY)

<u>THRUST</u>	<u>APPROACH</u>
o CELL R&T → 2 kW/kg	{ - 18% Si CELL - 50 μm Si CELL - CVD GaAs/CONCENTRATOR CELL - MULTIBANDGAP
→ LIFE (15%, 10 YR GEO)	{ - RADIATION IMMUNITY/GaAs - ANNEALING/RAD. HANDBOOK
→ \$5/W	{ - CBC/LARGE AREA Si/PEP CELL - NON-VACUUM PROCESSES/DOE LINE
o LOW COST BLANKETS/ARRAYS → \$30/W AT 100 kW	- CONCEPT TRADES - MODULE DEVELOPMENT - LOW COST SEP BLANKET
o HIGH PERFORMANCE BLANKETS/ARRAYS → >300 W/kg GEO/PLANETARY	- CONCENTRATOR CONCEPTS - PLANAR THIN CELL BLANKET

POWER MANAGEMENT AND DISTRIBUTION (3.4M/62 DPY)

<u>THRUST</u>	<u>APPROACH</u>
o COMPONENTS, CIRCUITS, SUBSYSTEMS → >100 kW → HIGH VOLTAGE → LIFE	- POWER TRANSISTORS, DIODES, SWITCHES, CAPACITORS - CONVERTERS, CDVM, INVERTERS - APSM (PLANETARY) - AMPS (LEO) - AC/DC MODEL
o ENVIRONMENTAL INTERACTIONS	- CHARGING DESIGN G/L/NASCAP - HV PLASMA INTERACTIONS/DESIGN GL
o THERMAL MGMT	- CONCEPT TRADES - ACQUISITION/TRANSPORT/REJECTION COMPONENTS

CHEMICAL ENERGY CONVERSION AND STORAGE (2.7M/43 DPY)

<u>THRUST</u>	<u>APPROACH</u>
o HIGH ENERGY DENSITY → 1MJ/kg	Li PRIMARY Li SECONDARY WAS SECONDARY
o HIGH CAPACITY → 100 kW LEO 25 kW GEO	TORROIDAL NiCd FUEL CELL/ELECTROLYZER Ni H
o FUNDAMENTALS → LIFE UNDERSTANDING	NiCd RECONDITIONING NiCd FAILURE MODEL SEPARATORS

THERMAL TO ELECTRIC CONVERSION (1.7M/12 DPY)

<u>THRUST</u>	<u>APPROACH</u>
o POWER FOR NEP → 20 kg/kW	- JOINT PLANNING WITH DOE/AF - REQUIREMENTS ANALYSIS/SYST DESIGN - CONVERTER TRADES TE/TI EXPERIMENTAL BRAYTON ANALYTICAL - HEAT PIPE/RADIATION COUPLING - GDS PLANNING
o RTG CONVERSION → >10 W/kg	- ADVANCED MATERIALS/CONVERTERS
o STG DEVICES	- PANEL DESIGNS/TESTS

ADVANCED ENERGETICS (1.3 M/24 DPY)

THRUST

o ADVANCED CONCEPT ASSMT

- OVERALL SOLICITATION/ASSESSMENT/REVIEW/WORKSHOPS
- SELECTED 'SEED MONEY' SUPPORT E.G.,
INERTIAL ENERGY STORAGE
PLASMA HEAT PIPE
SODIUM TE CONVERTER
LASER ANNEALING/WELDING
SPECTRA/THERMO PHOTOVOLTAICS*
- LIQUID DROP/PARTICLE RADIATORS
FLYWHEEL STORAGE

o LASER POWER GENERATION

* TRANSMISSION

- SOLAR PUMPING
- NUCLEAR PUMPING
- RECEIVERS

* CURRENTLY SUPPORTED IN
PHOTOVOLTAIC OBJECTIVE

SYNCHRONOUS ENERGY TECHNOLOGY (SET)

NEED:

MANY USAF & NASA MISSIONS WILL REQUIRE HIGH POWER
IN HIGH ORBITS

USAF: SPACE BASED RADAR, SPACE SURVEILLANCE,
SPACE WEAPONS

NASA: COMSATS, DIRECT BROADCAST, ELECTRONIC
MAIL

OBJECTIVE:

TO ASSURE TECHNOLOGY READINESS OF SYNCHRONOUS ORBIT
POWER SYSTEMS OF > 25KW BY 1985

BENEFITS:

ENABLING WITHOUT A NEW STS
AUTOMATED TO REDUCE COSTS AND VULNERABILITY AND TO
INCREASE RELIABILITY
MULTIPURPOSE MODULE CONCEPT

APPROACH:

DEVELOP DRAFT PROGRAM PLAN AT NASA/USAF WORKSHOP/MTG -
APRIL/MAY 1980

PLANNING

o NASA ADVISORY COUNCIL - SSTAC REPORT 1979

<u>HIGH BENEFIT</u>	<u>MODERATE/BENEFIT</u>	<u>LOW BENEFIT</u>
- >100 W/KG SILICON ARRAY	- AUTOMATED POWER SYST	- ADVANCED NiCd
- > 33 Wh/Kg Ni-H	- 300-1KV BUS/COMPONENTS	
- 100-300V BUS/COMPONENTS		
- >200 W/KG CONCENTRATORS		
- > 50 Wh/Kg INERTIA WHEELS		
- >50 Wh/Kg METHAL SULPHUR BATTERY		
- >50 Wh/Kg H ₂ O ₂ SYSTEMS		

o NASA/AF SET TECHNOLOGY PLANNING

- FOCUS TECHNOLOGY TOWARD GEO, >25 kW, 10YR
- IDENTIFY NEW APPROACHES/CONCEPTS
- ESTABLISH GOALS/ROLES/RESOURCES